Optimal Foraging in Nocturnal Granivores: An Examination of the Risks Associated with Substrate Produced Noise while Foraging

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Abstract

In nature, animals will find an optimal balance between risks and benefits of foraging. This was investigated by examining the amount of seeds eaten by nocturnal granivores in two substrate types: noisy and quiet. We accomplished this by placing feeders in vegetative cover with a predetermined amount of seeds in them. We found no significant difference between the mean number of seeds eaten across the two substrate types. This led us to reject our hypothesis that foragers would favor the quiet substrate over the noisy one in an attempt to avoid predation.

Introduction

Optimal foraging behavior provides animals with the greatest benefits at the lowest cost. Intuitively, these behaviors will provide an animal with a fitness advantage and will be highly selected for evolutionarily. In regards to foraging, optimal behavior is exhibited in a wealth of organisms and operates on the basic principle of balancing predation risks while maximizing energy gained. This study examines the concept of risk-sensitive foraging in nocturnal granivores.

The concept of risk-sensitive foraging essentially states that an animal will select for a food that contains the most energy that is also in an area were predation risk is low (Kotler et al. 1994). There must be a balance between predation risk and the benefit of the food in order for the behavior to be evolutionarily advantageous (Verdolin 2006).

We tested this concept using granivores as a model organism. To test the concept of risk-sensitive foraging, we placed feeding trays under cover and put a predetermined amount of seeds in each tray near either noisy or quiet substrate. We hypothesized that more food would be eaten from the trays without the noisy substrate.

Methods

We placed 10 523 cm^2 square feeders approximately 10m into vegetative cover. The feeders were spaced approximately 12m apart with alternating substrate types around each feeder. The two substrate types used were dry leaf litter (to produce noise) and substrate with leaves removed to produce little noise (control).

The feeders were baited with 50 oilseeds per feeder at sunset. The number of seeds eaten was counted at dawn of the following day and recorded. We replicated the procedure previously mentioned five times for a total of 50 replicates. The mean number of seeds eaten was calculated per substrate type (control and noisy) and graphically represented. A two-tailed t-test was used to assess the statistical significance between the means for the two substrate types.

Results

We found no significant difference in the mean number of seeds eaten between substrate types ($t=1.78$, $df=24$, $p=0.0876$; Figure 1).

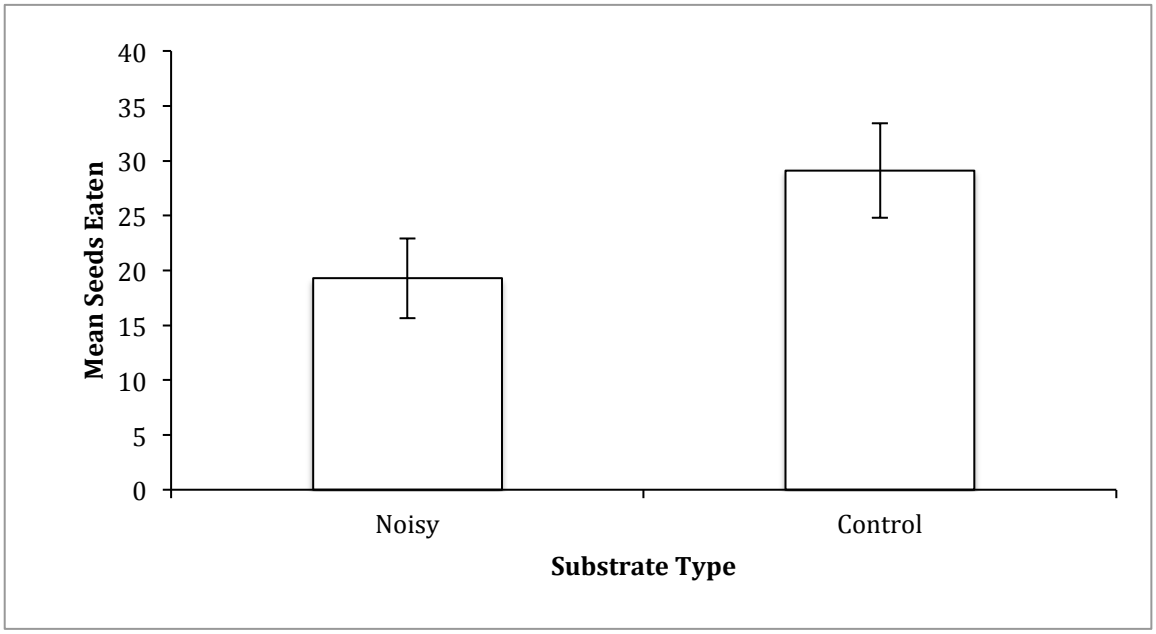

Figure 1. Mean (+ or - 1SE) number of seeds eaten per substrate type.

Discussion

Based on the results of a t-test, the difference between our two means was not statistically significant. Therefore, we concluded that the type of substrate will not be taken into account by the forager. This does not support our hypothesis. However, the results of a study by Barnum et al (1992) showed that the white-footed mouse (*Peromyscus leucopus*), which is a nocturnal granivore, actively avoided noisy leaf litter while foraging. Thus, it could be beneficial to repeat this experiment with more replicates, on clear nights with no rain, on more consistent substrate types and more consistent vegetative cover. All of which could provide unwanted confounding variables. We believe that the presence of rain would bias our results because the study by Barnum et al (1992) actively avoided tracking *P. leucopus* individuals during the rain due to the wet leaves producing less or no noise.

Future studies could examine how various kinds of substrates (pine needles, wood chips, etc.) would affect foraging choices in granivores. We could also examine the effects of olfactory cues on foraging choices, such as the presence of predator urine. The relationship between additional parameters and their effects on foraging behavior would provide insight into exactly what animals take into account when foraging.

References

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